

FORM PTO-1390 (M-dified)  
(REV 11-98)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

ATTORNEY'S DOCKET NUMBER

## TRANSMITTAL LETTER TO THE UNITED STATES

R.34436

DESIGNATED/ELECTED OFFICE (DO/EO/US)

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5)

CONCERNING A FILING UNDER 35 U.S.C. 371

09/601365

INTERNATIONAL APPLICATION NO.

INTERNATIONAL FILING DATE

PRIORITY DATE CLAIMED

PCT/DE 99/02265

23 July 1999

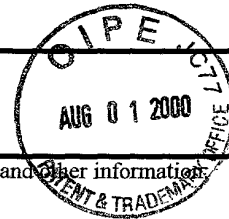
01 December 1998

TITLE OF INVENTION

APPARATUS FOR POST-TREATING EXHAUST GASES OF AN INTERNAL COMBUSTION  
ENGINE

APPLICANT(S) FOR DO/EO/US

MAHR, Bernd



Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☒ A copy of the International Search Report (PCT/ISA/210).
8. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
9. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
10. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
11. ☐ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).

## Items 13 to 20 below concern document(s) or information included:

13. ☐ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☐ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ Certificate of Mailing by Express Mail
20. ☒ Other items or information:

Transmittal Sheets in duplicate w/fees charged to Deposit Acct. 07-2100

Copy of German Text Application w/2 sheets drawings

Translation of German Text Application w2 sheets drawings

Preliminary Amendment

Executed Declaration (not enclosed)

Assignment to Robert Bosch GmbH (not enclosed)

Copy of PCT/RO/101, PCT/ISA/210 and 220

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR 1.5)

INTERNATIONAL APPLICATION NO.

ATTORNEY'S DOCKET NUMBER

09/601365

PCT/DE 99/02265

R.34436

21. The following fees are submitted:

CALCULATIONS PTO USE ONLY

**BASIC NATIONAL FEE ( 37 CFR 1.492 (a) (1) - (5) ) :**

- ☐ Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO ..... \$970.00
- ☒ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO ..... \$840.00
- ☐ International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... \$690.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) ..... \$670.00
- ☐ International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) ..... \$96.00

**ENTER APPROPRIATE BASIC FEE AMOUNT =**

\$840.00

Surcharge of \$130.00 for furnishing the oath or declaration later than ☒ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).

\$130.00

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE
Total claims	21 - 20 =	1	x \$18.00
Independent claims	- 3 =	0	x \$78.00

\$18.00

\$0.00

Multiple Dependent Claims (check if applicable).

\$0.00

**TOTAL OF ABOVE CALCULATIONS =**

\$988.00

Reduction of 1/2 for filing by small entity, if applicable. Verified Small Entity Statement must also be filed (Note 37 CFR 1.9, 1.27, 1.28) (check if applicable).

\$0.00

**SUBTOTAL =**

\$988.00

Processing fee of \$130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)).

\$0.00

**TOTAL NATIONAL FEE =**

\$988.00

Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) (check if applicable).

\$0.00

**TOTAL FEES ENCLOSED =**

\$988.00

Amount to be:  
refunded \$  
charged \$

- ☐ A check in the amount of \_\_\_\_\_ to cover the above fees is enclosed.
- ☒ Please charge my Deposit Account No. **07-2100** in the amount of **\$988.00** to cover the above fees.  
A duplicate copy of this sheet is enclosed.
- ☒ The Commissioner is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. **07-2100** A duplicate copy of this sheet is enclosed.

**NOTE:** Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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NAME

31,517

REGISTRATION NUMBER

01 August 2000

DATE

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## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Bernd Mahr

Based on PCT/DE 99/02265

For: Apparatus For Post-Treating Exhaust Gases Of An Internal Combustion Engine

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

Prior to examination, please amend the above-identified application as follows:

IN THE SPECIFICATION

Page 1, between lines 2 and 3, insert --BACKGROUND OF THE INVENTION--;

line 12, delete "various" and insert --varied--.

Page 2, line 4, delete "From" and before "a" insert --discloses--;

line 5, delete "is known";

line 11, delete "From" and before "a" insert --discloses--;

line 12, delete "is known,";

line 18, delete "From" and before "a" insert --discloses-- and delete "is known".

Page 3, between lines 3 and 4, insert --OBJECT OF THE INVENTION--;

line 5, delete "known" and insert --disclosed-- and before "from" insert --the European Patent noted above,--;

between lines 14 and 15, --SUMMARY OF THE INVENTION--;

delete lines 15-17.

Page 4, line 1, delete "evaporation" and insert --vaporization--;

line 12, delete "evaporator" and insert --vaporization--.

Page 5, line 19, delete "evaporated" and insert --vaporized--.

Page 7, line 3, delete "An" and insert --a--;

between lines 10 and 11, insert --BRIEF DESCRIPTION OF THE  
DRAWINGS--;

between lines 15 and 16, insert --DESCRIPTION OF PREFERRED  
EMBODIMENTS--.

Page 8, line 8, delete "18" and insert --16--.

Page 10, after line 18 insert the following paragraph:

--The foregoing relates to a preferred exemplary embodiments of the invention, it being understood that other variants and embodiments thereof are possible within the spirit and scope of the invention, the latter being defined by the appended claims.--.

## IN THE CLAIMS

Page 11, delete "Claims" and insert --I Claim--.

Please cancel claims 1-10 and add new claims 11-31.

11. An apparatus for post-treating exhaust gases of an internal combustion engine (2), comprising a reduction catalytic converter (4) which serves to reduce NO<sub>x</sub> ingredients of the exhaust gases and to which an exhaust pipe (6) leads, provided with a reducing agent supply device (8) and means to generate a pressure difference in the exhaust gas, and further provided with a bypass line (12) that bypasses the means (10) generating the pressure difference into which bypass line the reducing agent supply device (8) introduces the reducing agent.

12. The apparatus of claim 11, in which the bypass line (12) includes a valve (14) which is controllable.

13. The apparatus of claim 11, in which the bypass line (12) discharges into the exhaust pipe (6) via a ring conduit (16) provided with bores.

14. The apparatus of claim 12, in which the bypass line (12) discharges into the exhaust pipe (6) via a ring conduit (16) provided with bores.

15. The apparatus of claim 11, in which the bypass line (12) discharges into the exhaust pipe (6) via a spray tube (18).

16. The apparatus of claim 12, in which the bypass line (12) discharges into the exhaust pipe (6) via a spray tube (18).

17. The apparatus of claim 11, in which the bypass line (12) has an injection valve (8) for supplying the reducing agent.

18. The apparatus of claim 12, in which the bypass line (12) has an injection valve (8) for supplying the reducing agent.

19. The apparatus of claim 13, in which the bypass line (12) has an injection valve (8) for supplying the reducing agent.

20. The apparatus of claim 15, in which the bypass line (12) has an injection valve (8) for supplying the reducing agent.

21. The apparatus of claim 11, in which the bypass line (12) has a carburetor device (8) for supplying the reducing agent.

22. The apparatus of claim 12, in which the bypass line (12) has a carburetor device (8) for supplying the reducing agent.

23. The apparatus of claim 13, in which the bypass line (12) has a carburetor device (8) for supplying the reducing agent.

24. The apparatus of claim 15, in which the bypass line (12) has a carburetor device (8) for supplying the reducing agent.

25. The apparatus of claim 11, in which the bypass line (12) includes at least one catalytic converter (20), in particular a cracking catalytic converter (20).

26. The apparatus of claim 12, in which the bypass line (12) includes at least one catalytic converter (20), in particular a cracking catalytic converter (20).

27. The apparatus of claim 13, in which the bypass line (12) includes at least one catalytic converter (20), in particular a cracking catalytic converter (20).

28. The apparatus of claim 15, in which the bypass line (12) includes at least one catalytic converter (20), in particular a cracking catalytic converter (20).

29. The apparatus of claim 11, in which the reducing agent is selected from the group consisting of a urea, ammonia, and a solution of urea and water.

30. The apparatus of claim 11, in which the reducing agent is the fuel of the engine (2), in particular Diesel fuel.

31. The apparatus of claim 11, in which the means (10) generating the pressure difference is a turbine of an exhaust gas turbocharger.

IN THE ABSTRACT

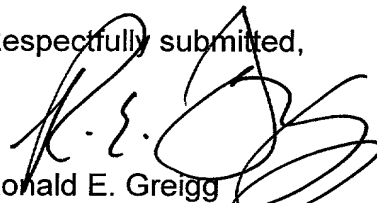
Please substitute the attached Abstract for the originally abstract as filed.

REMARKS

The above amendments are being made to place the application in better condition for examination.

Entry of the amendment is respectfully solicited.

Respectfully submitted,

A handwritten signature in black ink, appearing to read 'R. E. Greigg', written over the typed name.

Ronald E. Greigg  
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Attorney for Applicant

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## Abstract

An apparatus for post-treating exhaust gases of an internal combustion engine, in particular a Diesel engine, having a reduction catalytic converter serving to reduce NO<sub>x</sub> ingredients of the exhaust gases, to which reduction catalytic converter an exhaust pipe leads, and having a reducing agent supply device and a device that generates a pressure difference in the exhaust gas. In the apparatus, the supply of reducing agent is effected via a bypass line, which carries a portion of the exhaust gases past the device that generates the pressure difference in the exhaust gas. The apparatus can use either ammonia or a water and urea solution, or hydrocarbons of the fuel as well as CO as a reducing agent.

APPARATUS FOR POST-TREATING EXHAUST GASES  
OF AN INTERNAL COMBUSTION ENGINE

The present invention relates to an apparatus for post-treating exhaust gases of an internal combustion engine, having a reduction catalytic converter used to reduce NO<sub>x</sub> ingredients of the exhaust gases and having a device that generates a pressure difference in the exhaust gas, in particular but not exclusively for self-igniting internal combustion engines or Diesel engines with an exhaust gas turbocharger.

As limit values for emissions drop steadily, the most various apparatuses for post-treating exhaust gases of internal combustion engines have been developed in recent years. To achieve a reduction of NO<sub>x</sub> ingredients in exhaust gases, reduction catalytic converters have been developed, particularly for Diesel engines; typically these are subdivided into SCR catalytic converters, which have urea metering systems, and storage catalytic converters. The so-called SCR catalytic converters are regenerated by means of a supply of urea and/or ammonia reducing agent, while the so-called storage catalytic converters are regenerated with hydrocarbons of the entrained engine fuel, in so-called rich exhaust gas phases.

These rich exhaust gas phases can indeed be demonstrated internally of the engine in the lower rpm and load range, but

at higher rpm and higher torque, metered addition of reducing agents directly into the exhaust system is necessary, and preheating of the reducing agent may be necessary.

From German Patent Disclosure DE-A 196 25 447, a device  
5 for post-treating exhaust gases of an internal combustion engine is known in which exhaust gases are enriched with the fuel before reaching a reduction catalytic converter. This enrichment is done via an evaporator device, which thus introduces the liquid reducing agent in preheated and prepared  
10 form into the exhaust gas stream.

From European Patent Disclosure EP-A 0 381 236, a  
corresponding system is known, which to remove nitrogen oxides from exhaust gases from a Diesel engine meters in ammonia as a reducing agent. In this last system, a turbocharger is also  
15 provided, which lowers the pressure of the exhaust gas. The solution of urea and water is metered in by means of compressed air.

Finally, from U.S. Patent 5,067,320, a system is known which serves to combust exhaust gas particles in a combustion  
20 chamber designed for this purpose. The combustion chamber is supplied via two exhaust gas lines, one of which is equipped with a fuel supply in order to furnish a combustible mixture to the combustion chamber, by means of which mixture the exhaust gas particles of the remaining exhaust gas stream can  
25 be combusted. This combustion of exhaust gas particles,

however, is diametrically opposed to the goal of a catalytic converter, since this poorly controllable combustion of soot particles produces additional nitrogen oxides.

5 The object of the invention is to refine a generic apparatus, of the kind known for instance from EP-A 0 381 236, for post-treating exhaust gases of an internal combustion engine with a reduction catalytic converter used to reduce NO<sub>x</sub> ingredients of the exhaust gases, to which reduction catalytic converter an exhaust pipe leads, and having a reducing agent supply device and a device that generates a pressure  
10 difference in the exhaust gas, this refinement being done in such a way that a simple, optimized supply of reducing agent is effected, resulting in a better reduction of NO<sub>x</sub> ingredients in exhaust gases.

15 According to the invention, this object is attained by an apparatus having the characteristics of claim 1. Preferred embodiments are defined by the dependent claims.

20 In particular, in the attainment of this object according to the invention, a bypass line is provided, which bypasses the device that generates a pressure difference in the exhaust gases. The reducing agent supply device introduces the reducing agent into this bypass line. Thus according to the invention, a dynamic pressure prevailing in the system, for instance upstream of the turbine of an exhaust  
25 gas turbocharger, is utilized to prepare the reducing agent

and transport it. A certain evaporation and/or mixing of the reducing agent with some of the exhaust gases can already occur in the bypass line, so that at the entrance to the catalytic converter a more-homogeneous mixture of exhaust gas and reducing agent is present. If a urea and water solution is used as the reducing agent, then because of the utilization of the dynamic pressure, no additional compressed-air units are necessary, so that implementation of the invention even in the passenger car field appears possible. When the hydrocarbons entrained in the vehicle are used as a reducing agent, an otherwise necessary preparation by means of glow plugs or other evaporator devices are unnecessary because of the use of a cracking catalytic converter or a very small undersized catalytic converter. The invention thus enables NO<sub>x</sub> reduction even at high volumetric flows of exhaust gas, by means of a rich mixture cloud of HC and CO; the system has a compact design, without requiring electrical energy or additional units, while requiring only slight additional fuel consumption.

Advantageously, the bypass line includes a valve which in particular is controllable. Because the bypass line has a valve, the volumetric flow of exhaust gas moved past the device that varies the pressure can be adjusted or controlled, so that depending on engine parameters, optimal operation of the exhaust system can be achieved. Furthermore, various engine types and engine operating modes can be taken into account via the valve.

In order to unite the portion of the exhaust gas that is present in the bypass line and contains the reducing agent with the remainder of the exhaust gas, it is preferable that the bypass line discharges into the exhaust pipe via a ring conduit with bores. This embodiment furnishes a uniform, homogeneous mixing, so that overall, a homogeneous mixture of reducing agent and exhaust gas is present at the entrance to the catalytic converter.

Alternatively, the bypass line can also discharge into the exhaust pipe via a so-called spray tube. In this version, the portion of the exhaust gas that is diverted via the bypass line and that is enriched with the reducing agent is discharged into the remainder of the exhaust gas in the region of maximum flow velocity, so that once again a mixing of reducing agent and exhaust gas takes place.

In a preferred embodiment, the bypass line includes an injection valve for supplying the reducing agent, so that for the most part the reducing agent in the diverted portion of exhaust gas is already in atomized or evaporated form. In this version, it is possible for some of the reducing agent to condense on the wall of the bypass line, but this condensed reducing agent is partly evaporated by the heat of the exhaust gas and then is substantially completely evaporated at the latest upon mixing with the remaining exhaust gas, before entering the catalytic converter.

As an alternative to an injection valve, the bypass line can have a carburetor device for supplying the reducing agent. The function of a carburetor device is substantially equivalent to the injection valve, but a design corresponding to a suction-type jet pump can be especially advantageous, to make a feeding device for the reducing agent unnecessary. In other words, the reducing agent metering is determined via the flow prevailing in the bypass, or in other words in particular via the valve that controls the throughput through the bypass line.

In a preferred embodiment, the bypass line is assigned a further catalytic converter, which in particular can be embodied as a cracking catalytic converter. This additional oxidation catalytic converter should be relatively small and should convert only slight quantities of reducing agent, in particular hydrocarbon. A still further improved cleaning action of the exhaust system can thus be attained.

Finally, it is advantageous if the device that generates the pressure difference makes the work achieved available in some other way, for instance, if it is provided in the form of a turbine of an exhaust gas turbocharger. This has a synergistic effect; that is, in a system with a turbocharger, the dynamic pressure is used for the post-treatment of the exhaust gas, while the pressure of the exhaust gas itself is used to drive a turbocharger.

In summary, it can be stated that with the system according to the invention, a post-treatment of exhaust gases is made possible in a simple and efficient way. An NO<sub>x</sub> reduction can be accomplished even at high volumetric flows of exhaust gas, without requiring additional energy and/or such units as pumps, heaters, evaporators, and so forth.

Further advantages and characteristics of the invention will become apparent from the ensuing detailed description of several presently preferred embodiments, in conjunction with the accompanying drawings, in which:

Fig. 1 schematically shows an internal combustion engine with an associated exhaust system, including a preferred embodiment of the apparatus of the invention.

Fig. 2 shows a view similar to Fig. 1, but containing another preferred version of the apparatus of the invention.

The system shown in Fig. 1 is designed in particular to use a water and urea solution as the reducing agent. In the drawing, an engine 2 discharges exhaust gases into an exhaust manifold 3. In the exhaust manifold 3, there is an exhaust gas turbocharger 10 downstream, from which an exhaust pipe 6 leads to a reduction catalytic converter 4. A small portion of the exhaust gases present in the exhaust manifold is delivered to a bypass line 12, via a valve or other closing mechanism 14. Thus what prevails in the bypass line 12 is



substantially the dynamic pressure upstream of the turbine of the exhaust gas turbocharger 10. A water and urea solution is delivered to this bypass line, via a reducing agent supply device 8. In the embodiment shown, the reducing agent supply device 8 is provided in the form of an injection valve, so that the water and urea solution is at least partly atomized. The bypass line 12 discharges into the exhaust pipe 6 via a ring conduit 18 with bores, practically immediately upstream of the reduction catalytic converter 4.

As an alternative to the ring conduit with bores, the transition between the bypass line 12 and the exhaust pipe 6 can also be effected by way of a so-called spray tube, as shown in the detailed view. In this version, the end of the bypass line 12 is disposed substantially in the region of maximum flow velocity in the exhaust pipe, extending substantially parallel to it. Thus what is discharged from the spray tube 18 is a mixture of exhaust gas and water and urea solution, so that an intensive mixing and aerosol formation occurs. As a result, a practically "homogeneous mixture" of exhaust gas and reducing agent is present at the entrance to the reduction catalytic converter 4. Finally, for monitoring the function, an NO<sub>x</sub> sensor 24 can also be provided downstream of the catalytic converter 4. The control of the entire system can be effected via the engine controller itself, or via a separate controller that controls the valve 14 and the reducing agent supply device 8. In this

control, both engine operating parameters and output data from the NO<sub>x</sub> sensor 24 can be employed.

In Fig. 2, a system substantially analogous to Fig. 1 is shown, but it is intended in particular for using hydrocarbons or fuel as the reducing agent. As in the embodiment shown in Fig. 1, a portion of the exhaust gases is carried under exhaust gas turbocharger dynamic pressure past the turbine of the exhaust gas turbocharger 10 via a bypass line 12. As in the embodiment of Fig. 1, the reducing agent, in this case fuel and in particular Diesel fuel, is introduced into the bypass line. In contrast to the embodiment shown in Fig. 1, however, a carburetor device 9 is provided, which introduces the reducing agent into the portion of the exhaust gas stream in the bypass line 12. Downstream of the reducing agent delivery 9, a catalytic converter 20 of small size is additionally provided in the embodiment shown in Fig. 2. The catalytic converter 20 in the embodiment shown is a so-called cracking catalytic converter, which acts as an oxidation catalytic converter. This catalytic converter converts slight quantities of hydrocarbon, but the predominant portion of hydrocarbons is evaporated in or downstream of this catalytic converter or converted into carbon monoxide, and is then supplied afterward, upstream of the actual catalytic converter, to the exhaust gas stream for reducing NO<sub>x</sub>. The reducing agent can preferably be used in the form of rich mixture clouds for reduction in the catalytic converter. As in the embodiment described above, the transition between the

bypass line 12 and the exhaust pipe 6 takes place via a ring conduit 16 with bores or alternatively via a spray tube 18.

Although the present invention has been described entirely with reference to preferred embodiments above, one skilled in the art should recognize that the most various modifications are possible and in this sense should be considered to be covered as equivalence by the claims. For example, the device that generates a pressure difference in the exhaust gas can also be a simple throttle, which does use the pressure difference to drive a turbocharger.

By briefly metering in reducing agent, a very rich mixture cloud can be employed for reducing the catalytic converter, and as a result a reduction in the full stream is attained, without exhaust gas valves (as in the case of the storage catalytic converter, for instance).

Advantageously, carbon monoxide directly from a bottle of compressed gas can be used as the reducing agent, without a bypass line.

APPARATUS FOR POST-TREATING EXHAUST GASES  
OF AN INTERNAL COMBUSTION ENGINE

Abstract

5 An apparatus for post-treating exhaust gases of an  
internal combustion engine, in particular a Diesel engine,  
having a reduction catalytic converter serving to reduce NO<sub>x</sub>  
ingredients of the exhaust gases, to which reduction catalytic  
converter an exhaust pipe leads, and having a reducing agent  
supply device and a device that generates a pressure  
10 difference in the exhaust gas. In the apparatus, the supply  
of reducing agent is effected via a bypass line, which carries  
a portion of the exhaust gases past the device that generates  
the pressure difference in the exhaust gas. The apparatus can  
use either ammonia or a water and urea solution, or  
15 hydrocarbons of the fuel as well as CO as a reducing agent.

## Claims

1. An apparatus for post-treating exhaust gases of an internal combustion engine (2), having a reduction catalytic converter (4) which serves to reduce NO<sub>x</sub> ingredients of the exhaust gases and to which an exhaust pipe (6) leads, having a reducing agent supply device (8) and device which generates a pressure difference in the exhaust gas, characterized in that a bypass line (12) that bypasses the device (10) generating the pressure difference is provided, into which line the reducing agent supply device (8) introduces the reducing agent.
2. The apparatus of claim 1, characterized in that the bypass line (12) includes a valve (14) which in particular is controllable.
3. The apparatus of claim 1 or 2, characterized in that the bypass line (12) discharges into the exhaust pipe (6) via a ring conduit (16) with bores.
4. The apparatus of claim 1 or 2, characterized in that the bypass line (12) discharges into the exhaust pipe (6) via a spray tube (18).
5. The apparatus of one of the foregoing claims, characterized in that the bypass line (12) has an injection valve (8) for supplying the reducing agent.

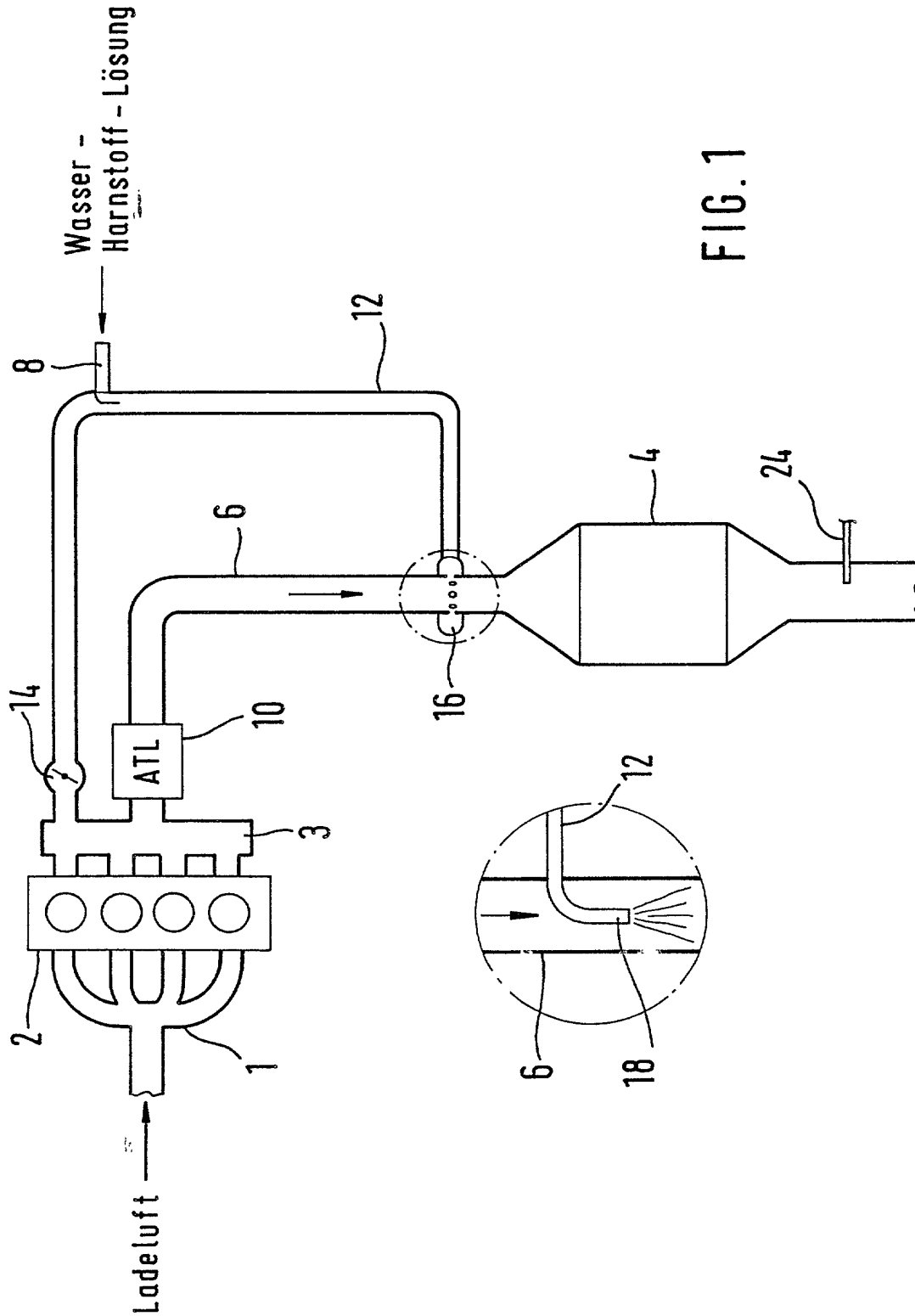
6. The apparatus of one of claims 1-4, characterized in that the bypass line (12) has a carburetor device (8) for supplying the reducing agent.

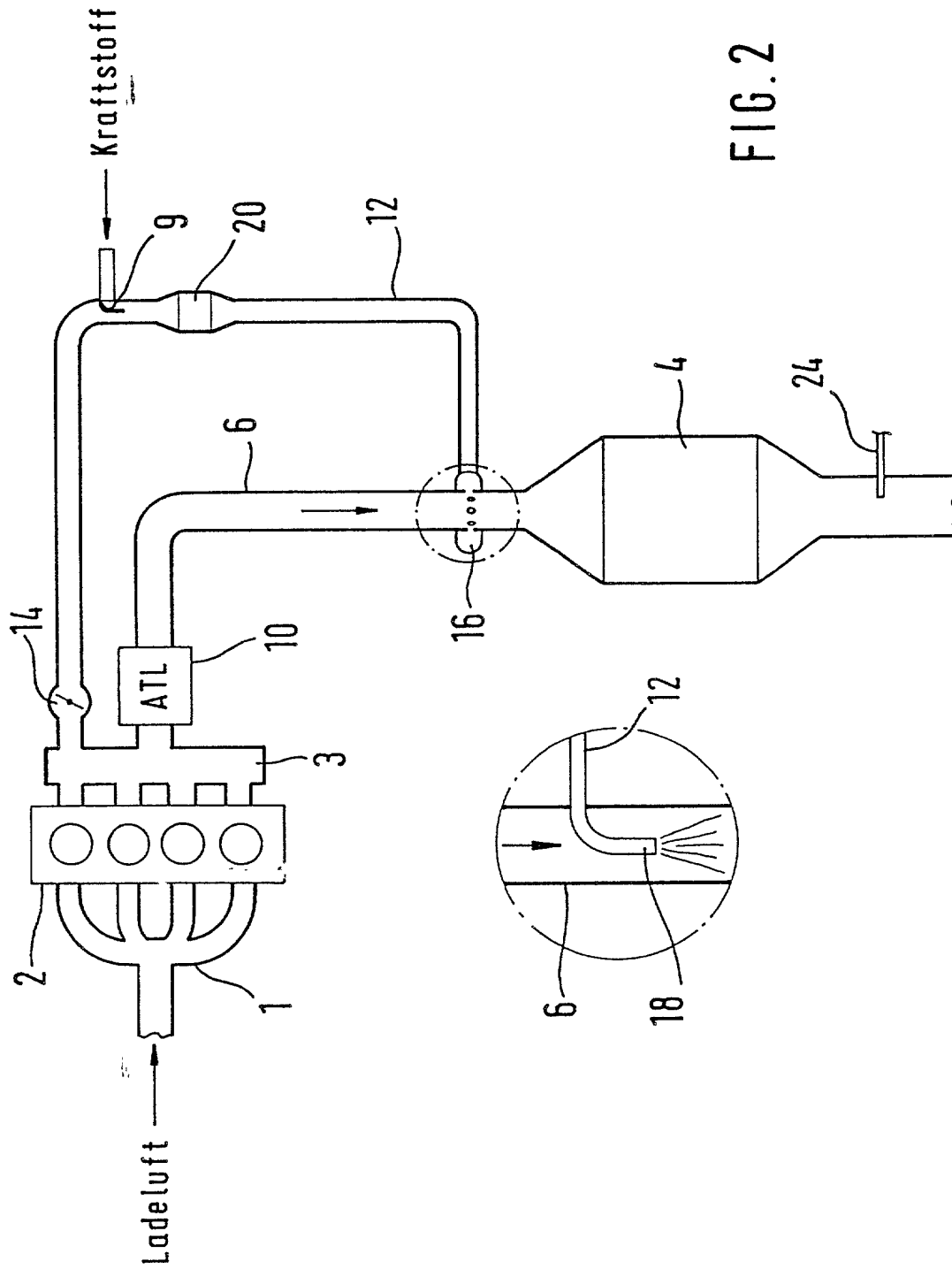
7. The apparatus of one of the foregoing claims, characterized in that the bypass line (12) includes at least one catalytic converter (20), in particular a cracking catalytic converter (20).

8. The apparatus of one of the foregoing claims, characterized in that the reducing agent is a urea, ammonia, or a solution of urea and water.

9. The apparatus of one of claims 1-7, characterized in that the reducing agent is the fuel of the engine (2), in particular Diesel fuel.

10. The apparatus of one of the foregoing claims, characterized in that the device (10) generating the pressure difference is a turbine of an exhaust gas turbocharger.







Docket No.  
R.34436

# Declaration and Power of Attorney For Patent Application

## English Language Declaration

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

### APPARATUS FOR POST-TREATING EXHAUST GASES OF AN INTERNAL COMBUSTION ENGINE

the specification of which

(check one)

- ☐ is attached hereto.
- ☒ was filed on 23 JULY 1999 as United States Application No. or PCT International  
Application Number PCT/DE 99/02265  
and was amended on \_\_\_\_\_  
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d) or Section 365(b) of any foreign application(s) for patent or inventor's certificate, or Section 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT International application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application(s)			Priority	Not Claimed
<u>1 98 55 348.6</u>	<u>GERMANY</u>	<u>01 DECEMBER 1998</u>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)		
_____	_____	_____		<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)		
_____	_____	_____		<input type="checkbox"/>
(Number)	(Country)	(Day/Month/Year Filed)		

I hereby claim the benefit under 35 U.S.C. Section 119(e) of any United States provisional application(s) listed below:

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

I hereby claim the benefit under 35 U. S. C. Section 120 of any United States application(s), or Section 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of 35 U.S.C. Section 112, I acknowledge the duty to disclose to the United States Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, C. F. R., Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of this application:

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Status)  
(patented, pending, abandoned)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Status)  
(patented, pending, abandoned)

\_\_\_\_\_  
(Application Serial No.)

\_\_\_\_\_  
(Filing Date)

\_\_\_\_\_  
(Status)  
(patented, pending, abandoned)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

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